Technology: Advancing the Practice and Profession of Nurse Anesthesia

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Disclosure:

- No financial conflicts
- Owner and developer of PROCRNA.COM
- Texas State Advocate for the AANA Foundation
- Products described in this talk are meant to represent the technology and not the individual vendor.
Evolution of Technology

- Better
- Newer
- Easier
- Larger (or smaller)
- Faster (or slower)
- Less Expensive
- Energy Efficient
- Safer
Then and Now
Early Anesthetics
Risks of Early Anesthetics:

- Airway management
- Composition of inhaled gas (O₂ & N₂O)
- Concentration of Anesthetic agent
Then and Now

Gauze Mask

Modern Vaporizer
100 Years of Progress
Moving From Then to Now

- **Creative Thinking:**
  - *Creativity* refers to the invention or origination of any new thing that has value.
  - Those giving the anesthetic best know what needs to be improved.

**Act on your Ideas**
- Thoughts are just day dreams until you put them to use.
- Dare to think outside the box...then follow through.
Thinking inside the Box

- To think in traditional fashion, bound by old, nonfunctional, or limiting structures, rules, or practices.
- “make a better mouse trap”
Thinking Outside the Box

• “To think differently, unconventionally, or from a new perspective.
• Star Trek Anesthesia
You get back to that goddamn cubicle and start thinking outside the box!
Moving from Then to Now

Gauze Mask

Modern Vaporizer
Ether Inhaler
Creative Thinking

Mask

Gas Delivery

Vaporizer
Verni-trol® Anesthetic Vaporizer Flow Calculator

Step 1: Set concentration desired at Total Flow. For all practical purposes, the total flow may be considered the sum of all flows shown on the flowmeters.

Step 2: Read flow thru Verni-trol vaporizer at temperature for agent selected. Values are based upon a barometric pressure of 760 mm Hg.

Anaquest
A Division of BOC Inc
BOC Health Care

Liquid Temperature °C

Flow Thru Verni-trol Anesthetic Vaporizer
Vernitrol / Copper Kettle

Vernitrol variable bypass

“Prayer wheel”
However.....

- Patients were still injured with hypoxic injuries
  - “Fail safe” was not fail safe
  - Gas flows were manually set
  - Machines could deliver 100% N₂O
  - Pulse oximetry had not yet been introduced to practice
- OB and Anesthesia had highest number of law suits
- Anesthesia made an industry wide commitment to improving patient safety
  - Anesthesia Patient Safety Foundation.
Anesthesia Patient Safety Foundation

- Established to improve patient safety
- Crosses all professional lines
  - CRNAs
  - MDs
  - Engineers
  - Manufacturers
  - Vendors
The APSF’s Mission is to improve continually the safety of patients during anesthesia care by encouraging and conducting:

- Safety research and education;
- Patient safety programs and campaigns;
- National and international exchange of information and ideas.
Culture of safety

• Shared values
• Anticipate events
• Inform and teach
• Develop a plan
• Engage
• Empower
• Recognize & reward
Technology Breakthroughs for Anesthesia Safety

- **Pulse Oximetry**
  - Became “standard of care” almost overnight.

- **Anesthetic gas analysis**
  - First systems were multiplexers serving the entire OR
  - Now standard on every machine.

- **Fiberoptic imaging.**
  - Quickly adapted for intubation
Airway Management

Standard intubation is based on line of sight visualization.
Fiberoptic Technology

A technology that uses glass (or plastic) threads (fibers) to transmit data. A fiber optic cable consists of a bundle of glass threads, each of which is capable of transmitting messages modulated onto light waves.

Fiber optics has several advantages over traditional metal communications lines:
Just for fun.....
Video Laryngoscopes

- Reliable Airway management
- Replacing fiberoptic intubations
- Standard of Care?

The McGrath® Video Laryngoscope is the first fully portable video laryngoscope designed for difficult airways and wherever a laryngoscope would normally be used.
Anesthesia Staffing: First Robotic Tracheal Intubations in Humans Using the Kepler Intubation System

Author: Lindsey Crawford

T. M. Hemmerling; R. Taddei; M. Wehbe; C. Zacout; S. Cyr; J. Morse


Abstract

Background Intubation is one of the most important anaesthetic skills. We developed a robotic intubation system (Kepler intubation system, KIS) for oral tracheal intubation.

Methods In this pilot study, 12 patients were enrolled after approval of the local Ethics board and written informed consent. The KIS consists of four main components: a ThrustMaster T.Flight Hotas X joystick (Guillemot Inc., New York, NY, USA), a JACO robotic arm (Kinova Rehab, Montreal, QC, Canada), a Pentax AWS video laryngoscope (Ambu A/S, Ballerup, Denmark), and a software control system. The joystick allows simulation of the wrist or arm movements of a human operator. The success rate of intubation and intubation times were measured.

Results Eleven men and one woman aged 66 yr were included in this study. Intubation was successful in all but one patient using KIS at a total time of [median (inter-quartile range: range)] 93 (87, 109; 76, 153) s; in one patient, fogging of the video laryngoscope prevented
Kepler Intubation System

Controller is a standard gaming joystick with the possibility to program up to 12 buttons.
Keys to Medical Technology

- Sensors
- Data processing
- Display
Early Computers

- Large in size
- Produced large amount of heat
- Had to be programmed separately for each task.
1980’s: Computers become main stream

- Word processing
- Supply ordering
- Data storage
Digital Technology Enhances Clinical Practice

- Digital imaging and algorithms for data analysis have lead to many breakthroughs to enhance patient care.
Radiology / Ultrasound images

- Vascular access
- Regional blocks
- Standard of care?
Tracheal rapid ultrasound exam (T.R.U.E.) for confirming endotracheal tube placement during emergency intubation.


Source:
Department of Emergency Medicine, National Taiwan University Hospital, Taipei, Taiwan. erichaochang@gmail.com

Abstract

OBJECTIVES:
This study aimed to assess the diagnostic accuracy and timeliness of using tracheal ultrasound to examine endotracheal tube placement during emergency intubation.
To BIS or Not to BIS?
“Awake during Anesthesia” is a major fear

Well known by Lawyers and Media

Indicates
- Depth of anesthesia
- Trends
Bilateral BIS

BIS Bilateral Sensor features
- Same peel-and-stick simplicity
- Designed for symmetrical placement to capture bi-hemispheric data
- Letter indicators for electrode positions
- Liner card with break away tab sections

You can only use the Bilateral sensor with a BIS VISTA monitor with minimum 3.0 software and BISx4; it will not be recognized by BISx
Cerebral Oximetry
Cerebral Oximetry in Cardiac Surgery

By: Thomas J. May, D.O.
& Phillip E. Greilich, M.D., FAHA
University of Texas Southwestern Medical Center at Dallas
Department of Anesthesiology and Pain Management

“The development of a neurological monitor capable of detecting ischemic events during cardiac surgery is long overdue. Emerging evidence suggests that cerebral oximetry may be capable of detecting ischemic events, guiding therapeutic interventions, and possibly reducing the incidence of neurological and systemic insults during cardiac surgery.”
Fluid Management

- Vigileo monitor
  - Stroke Volume Variation
  - “if it’s below 12, give albumin”
Minimally Invasive Hemodynamic Monitoring
Vigileo Monitor

- “Getting ml/beat from mmHg”
- Arterial Pressure-based Cardiac Output

FloTrac Sensor
- Arterial pressure based CO
- Measured from A-Line
- Applied physics in complex algorithm
Nexfin
Noninvasive, continuous hemodynamic monitoring

- CO/CI
- Sys/Dias
- MAP
- HR
- SV
- SVV
- SVR
If something were wrong, how would you know?
“Triple Low”

- Hypotension
- Low BIS
- Low end tidal agent
Researchers amplify variations in video, making the invisible visible

New software amplifies changes in successive frames of video that are too subtle for the naked eye.

Larry Hardesty, MIT News Office

June 21, 2012

At this summer's Siggraph — the premier computer-graphics conference — researchers from MIT's Computer Science and Artificial Intelligence Laboratory (CSAIL) will present new software that amplifies variations in successive frames of video that are imperceptible to the naked eye. So, for instance, the software makes it possible to visibly see changes in skin color caused by the pumping of the blood.

In these frames of video, a new algorithm amplifies the almost imperceptible change in skin color caused by the pumping of the blood.

PHOTO: MICHAEL RUBINSTEIN
Eularian Video Magnification

- New technology from MIT
  - Filters image to seek variation
  - Magnifies variation x 100
  - Displays new image
  - Shows motion / color change not detected by the eye
Patient Identification
Track Your Equipment
Internet, iPhone and iPad
Text message on phone:

“Your husband’s induction was smooth. Anesthesia autopilot has been set and now we are programming the procedure into the surgical robot.”
The Internet

- Safety
- Communication
- Education (patient and provider)
- Data collection and storage
- Facilitates “top of license” practice
- Anesthesia related APPs
Patient use of internet

- Know about procedure
- Know safety concerns
- Know about you and your group / hospital
- Patient access to national quality forum
Google “questions to ask about anesthesia”

- Are there different kinds of anesthesia?
- Is anesthesia safe?
- What are the risks of anesthesia?
- How do they know how much to give?
- Should I continue my medications?
- What happens during the pre-op visit?
- What is the difference between an Anesthesiologist and a Nurse Anesthetist?
“As physicians, anesthesiologists go through years and years of rigorous training. Anesthesiologists have at least eight years of post-graduate education and training, while nurse anesthetists have two-three years.”
“Nurse anesthetists are able to perform the technical aspects of the administration of anesthesia, but anesthesiologists have the education, skills and training to fully manage patients and respond to medical complications."
The good, the bad and the ugly
What is your favorite Medical App?
AliveCor iPhone ECG
http://alivecor.com/
Ford Driving Health, Safety With Mobile Apps

The new programs may eventually warn patients with chronic disorders of an impending emergency, or let them upload data directly to a personal health record.

By Marianne Kolbasuk McGee • InformationWeek
May 18, 2011 01:00 PM

Ford Motors is working to bring new meaning to the term "mobile healthcare apps." The automobile maker is researching in-car health and wellness connectivity services and applications for people with chronic conditions such as diabetes and allergies. And if you're prone to road rage, a stress monitoring app may help you "tame the beast."

The apps leverage the Bluetooth connectivity, voice control, and cloud-based services of Ford's Sync "infotainment" system that allows drivers to make hands-free calls from their cellphones, use voice commands to change the music playing on their MP3 players, as well as access
A far cry from the 1980s "I've fallen and I can't get up" panic buttons, today's mobile personal emergency response service (MPERS) devices include GPS locators, accelerometers to detect falls automatically, and embedded cellular chips to summon help even if the wearer blacks out and is unable to push a button.
Intelligent M Handwashing Bracelet

- Enforces Compliance
- Records length of time for washing
- Vibrates when hands have been washed a sufficient time
- Alerts observers about level of compliance
Electronic Medical Records

- CMS incentives
  - Funded by stimulus package money
  - $44,000 from Medicare
  - $63,750 from Medicaid

The Official Web Site for the Medicare and Medicaid Electronic Health Records (EHR) Incentive Programs

The Medicare and Medicaid EHR Incentive Programs provide incentive payments to eligible professionals, eligible hospitals and critical access hospitals (CAHs) as they adopt, implement, upgrade or demonstrate meaningful use of certified EHR technology. Eligible professionals can receive up to $44,000 through the Medicare EHR Incentive Program and up to $63,750 through the Medicaid EHR Incentive Program.
Protected Patient Information

- Department of HHS
  - Office of Civil right
- Pilot program to investigate 20 medical centers for HIPAA violations
  - $50K fine per occurrence.

Chief CRNA: Are your Electronic Records Secure?
BY ADMIN ON SEPTEMBER 26, 2012 ⋅ 6 COMMENTS

Patient privacy and the security of protected health information is a hot issue throughout healthcare from the primary physician’s office through diagnostic testing and including records of hospitalization. The Federal Government is urging health care workers to move to total electronic records and have initiated bonus money to encourage compliance. However, the move to electronic records presents the challenge of security.

Writing for the online blog The Anesthesiology Insider, Tony Mira states:

"Collecting, analyzing, reporting and storing electronic patient information present perhaps even greater HIPAA challenges than does the use of paper records, however. Data entered on a computer can be copied more easily, more cheaply, more prolifically and even passively. Once unsecured data are moved from the computer on which they are created to other media, manually or wirelessly, controlling the information becomes nearly impossible."

A recent case, settled with the Edina Care Care Group Center demonstrates the cost of not...
“The internet has opened the door to consumer driven health care. Patients can process and store their own data on personal devices and receive diagnosis and treatment from computer based algorithms.”
Operating Room Management

• “Wouldn’t it be great if...”
• “Somebody ought to...”

• Remember, you are on the front line know what needs to be done. If you can’t do it yourself, find somebody who can and get it done.
The Electronic Chalk Board
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<th>Pt #</th>
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<th>Pt #</th>
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Welcome to Scott and White Memorial Hospital
Please enjoy our wireless internet on TimeWarnerAccess
Education / Information

ARIES
Anesthesia Reference, Information, Education and Search System

OR Tools:
- iPhone/Mobile version
- Sequoia 5
- OR Status
- Today's OR Schedule
- Tomorrow's OR Schedule
- Lexicomp (drug info)
- Dept of Anes Preferences and Suggestions
- POC Testing Info (iStat, HemoCue)
- Mirage (includes DocuSafe)
- Acquire Scanned Records Archive
- Metric Conversion
- Body Mass Index (BMI) Calc
- OR/PACU Forms
- Operating Room Transfer of Care
- Pyxis Drug Location List (searchable pdf)

OR Information:
- Resident ACGME Caselog
- Stat Reading of Xrays
- DocuSys Info and FAQs
- Phone Lists
- Outlook OWA - email
- Patient Watch
- Paper Anesthesia Record Checklist
Does your group need a Dedicated web site?
Dedicated web site

- Communication
  - Email and text
- Education
  - Inform and teach
- Scheduling
- Staff engagement
- Recruiting
- Social
Communication

Department M&M Conference
9/13/12

The next departmental M&M Conference will be this Thursday at the usual place and time. The following cases are scheduled to be presented.

1) Management of postop hypotension in the PACU/DSU
   - TAD/NAL/DC
2) Extubation in the IR suite - GWL/JR
3) Postop median nerve neuropathy - GWL

Hope to see you there.
Feel free to contact with any questions or concerns.

Thank you,
Ben Vacula
CRNA Meeting
Thursday August 2nd, 0645
Department Conference Room
We've been bounced the last 2 times we tried to meet....this time we are going to have a meeting. Please plan to attend.

Check the Schedule

Next week is the "overlap" week that appears on both the July and August schedules. As changes are made, sometimes they don't show up on both schedules so they get out of sync. Next week we will go by the AUGUST schedule. Click below to view the latest version of the schedule.

click here to download August
Education

3D Procedures

There have been some ongoing problems in 3D that the CRNAs can take the lead in correcting. Christe Mossman is the point of contact for 3D and has talked with the head nurse. Please read through the following and talk with Christe if you have questions:

- Your Senior Staff must be present for induction just as they are required to do in the Main OR. If you start out as a MAC and convert to a general anesthetic, the Senior Staff MUST be notified in a timely manner.
- Paperwork requirements: You must copy the anesthetic record. The original stays with the patient and the copy goes with your packet of papers to the recovery room box. You must sign the green sheet to sign the patient out of recovery and you must document SCIP measures. There is a paper included in the 3D packet that lists SCIP requirements.
- Narcotics are available in the 3D pyxis. You are encouraged to use
# Scheduling

## November 2012
requests open on July 20th at 9pm

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### Call Sign-up

- **Name**
- **Call date requested**
- **Shift requested**
- **Comments**

Submit | Reset
**Recruiting**

Are you a CRNA who is interested in joining a great team at Scott & White?

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<th>Name:</th>
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<th>email address:</th>
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<th>Where are you located?</th>
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<th>How many years have you been a CRNA?</th>
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<th>When are you available?</th>
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<th>Would you like to be contacted by our CRNA recruiter?</th>
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Contact: Mike Walsh, Chief CRNA
mwalsh@swmail.sw.org

Tom Davis, CRNA recruiter
tsdavis@swmail.sw.org

Tara Moore, physician recruiter
tmoore@swmail.sw.org
Scott & White Health System
2401 South 31st St.
Social

October 13th
Book club

Book club info:
We are reading Unbroken by Laura Hillenbrand. We will meet Saturday, October 13th at 10:00. See you there!

Open House at Jan VanCleave’s House

September 16th  1-5 PM
Check back for details.
Happy Birthday!
Rosalinda Andang
Sept

It's Party Time!
Happy Birthday

Reid Anthony LeFrere

Kynlie Clare FeFrere
Welcome to our Anesthesia Group web pages. As CRNAs, we are fortunate to work in a high tech environment with an employer who has a stated goal of becoming the most valued name in health care in America. Please browse our pages and learn about who we are and what we do. If you are interested in a great CRNA job working with an exceptional group of Nurse Anesthetists, please check out our recruiting page. If you are a Registered Nurse or student nurse interested in learning more about the profession of Nurse Anesthesia, please check out our "CRNA for a day" page.

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